

EMMA with 4 Modules: Commissioning Similar to Full Ring

J. Scott Berg

Brookhaven National Laboratory

11 March 2010

Outline

- Experimental tasks
 - Injection
 - Closed orbit and tunes
 - Time of flight
 - Lattice correction
 - Cavity phasing
- Advantages and Disadvantages

Injection

- Same problem as full ring
- Can't precisely determine closed orbit
 - More on next slide
- Don't care if kicker pulse is too long
 - Allows more time to get right

Closed Orbit and Tunes

- Can't find truly “closed” orbit
 - Pretend cells are identical
 - Pseudo-closed orbit minimizes cell-to-cell variation
- Tunes: again, pretend cells are identical
 - NAFF on cell-by-cell data (few cells)
 - Least squares to sinusoidal

Time of Flight

- Can't do two passes by same object
- Could use BPMs
 - Systematic offset (small) since two different BPMs
 - Still get relative variation (vs. energy)
 - Accuracy may be challenging
- Would need two (preferably identical) scopes

Lattice Correction

- Could get rough idea of tune and time of flight vs. energy
- Could correct lattice to desired configuration using this
- Correction not precisely what we want: need to check against truly closed orbit
- Likely very close, however
- Maybe correct cell-to-cell variation?

Cavity Phasing

- Can't set cavity frequencies: redundant with phase when only one pass
- Can attempt cavity phasing exercise
 - Power cavities, adjust phase to minimize orbit deviation downstream
 - Won't give final settings: frequency must be set with closed ring
 - Probably waste of time, since real algorithm must do frequency and phase

Advantage: Get Started Sooner

- Can begin getting machine in shape now
- Major injection problems identical
 - Can wait for better solution for kicker supply
 - Finding closed orbit slightly different
- Find closed orbit parameters vs. energy
 - At least good guesses
- Bring lattice closer to desired state
- Experiments not possible in ring (Shinji's talk)

Disadvantage: Delay

- Work needed for partial ring delays work needed for full ring. Only partial overlap.
- Algorithms and procedures similar but not identical to those for full ring
 - Repeat for full ring, but will start close
- Costs in time/money
 - Additional work in construction
 - Some repetition of experimental work
 - Time better spent preparing for full ring?

Disadvantage: Delay

- Do we demonstrate anything interesting?
 - No significant acceleration possible
 - At best almost get linear parameters vs. energy
 - Experiments that are not possible in full ring
(Shinji's talk)
- Could we realistically have anything for IPAC?

Summary

- Can begin work needed for full ring
 - Would be done imperfectly, some (maybe small) repetition needed in full ring
- There are costs associated with the delay
- Advantage of early start unclear (haven't seen Rob's talk at time of writing...)
- But partial ring may give additional experimental possibilities